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West Europe Report

SCIENCE AND TECHNOLOGY

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WEST EUROPE REPORT

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SCIENTIFIC AND INDUSTRIAL POLICY

ADVANCED MATERIALS

SIEMENS OF FRG MAKES AMORPHOUS METALS 1 MM THICK

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
4 Oct 84 p 7

/Article: "Amorphous Metals of Millimeter Thickness"/

/Text/ Frankfurt--Previously, metals with an amorphous structure could be produced only as very thin tapes. In the Siemens Research Center in Erlangen, scientists have recently, for the first time, succeeded in preparing such amorphous-metal tapes with a thickness of a millimeter and have even made tubes from this material.

Amorphous metals have disordered--thus noncrystalline--structure like glass, hence the name metallic glasses. The usual phenomenological model of a metal is, however, the crystal lattice structure. For this reason the production of amorphous metals is very difficult and has been possible on a technical scale only for a few years. On the other hand, these metallic glasses have a set of extraordinary and technically interesting properties. With proper compounding, they can be ideally weakly magnetic, have a high hardness value with simultaneous high ductility (nonbrittleness) and be highly resistant to corrosion. Reason enough for researchers around the world to be delving into this subject.

Amorphous metals consist of at least two different elements mixed or alloyed together. To obtain amorphous tapes, the metallic melt must be cooled so rapidly that no time is available for a crystalline structure to form. This is achieved by spraying the melt on a rotating, cooled cooper drum. For the cooling rates achievable, the foils produced can reach, at best, a thickness of 0.05 mm.

As Siemens researchers revealed recently at a meeting of the Materials Research Society in Strassburg, they are making use of the effect of rapid diffusion for the production of thicker amorphous metals. This effect was discovered quite recently by researchers at the California Institute of Technology in connection with extremely thin vapor-deposition films. This process has recently been demonstrated for thick amorphous metals in the nickel-zirconium (Ni-Zr) compound. For the demonstration, thin foils of nickel and zirconium with a thickness of about 25 micrometers with alternatingly layered, spirally wound and finally highly strained. With subsequent heating for several hours at temperatures between 300 and 350 degrees C, the Ni atoms diffuse into the Zr

layers. At these temperatures the Zr atoms are practically immobile; the result is the formation of an amorphous structure which can be confirmed by X-ray diffractometry. Once formed, the amorphous phase is stable up to about 500 degrees C, according to Siemens. By using this process, it has been possible in the Siemens laboratories to produce not only amorphous wires about 1-mm thick but also amorphous tubes of Ni-Zr. Much thicker amorphous materials of almost any shape can be produced with the same process by using more material. In addition to Ni-Zr alloys, amorphous nickel-titanium (Ni-Ti) alloys have already been produced.

9160
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AEROSPACE

SOME EUROPEANS VOICE OPPOSITION TO SPACE STATION PARTICIPATION

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 29 Aug 84 p 25

[Article by Guenter Paul: "No Need for the Space Station: High Costs and Little Usefulness/A Backward Step for Science/European Participation Undesirable"]

[Text] In discussions of European participation in the American space station which is being promoted by President Reagan the public often overlooked the fact that in the eyes of scientists this project represents a big step backward. Therefore researchers in the FRG, at least since the occasion of a congress of the German Research and Testing Institute for Aeronautics and Astronautics (DFVLR) at the end of 1982, exhibit a rare degree of unanimity in opposition to the station for which in their opinion there is absolutely no need. But also in other European countries scientists consider Europe's leaning toward the United States with respect to manned space travel to be justifiable only politically, but otherwise wrong. At the beginning of this year Reagan heralded the construction of the station as a stimulating major project for the nineties.

As recently as June the Space Science Committee of the European Science Foundation (ESF) founded by the European Council passed a resolution to the effect that Europeans should closely scrutinize any participation in the American space station. Because, they maintain, apart from certain exceptional cases, the space station will have no usefulness and also in these exceptional cases there is still a question as to whether participation is necessary at all. And the ESF points out that the European Space Flight Authority (ESA) has already reached the limits of its financial strength. If sufficient money is not forthcoming for at least one large satellite every 3 years then there exists the danger that working groups involved in space research may dissolve. And this limit has already been almost attained. If the Europeans want to expend 5 billion marks for the American space station without damage to themselves then the ESA funding must be considerably increased. But whether this will happen to a sufficient extent is very questionable.

Disillusionment With Spacelab

The high development costs have moreover also already led to enormous disappointment with the Space Shuttle and with the European development called

Spacelab. Originally NASA wanted its space transporter to make 500 flights during the eighties, of which 250 were to be with Spacelab. Now only 100 flights of the Space Shuttle are anticipated, of which 35 will be with Spacelab. The Europeans have expended about 2 billion marks for the construction of Spacelab, but for this they are receiving only a single free flight and even on this they were obliged to leave half the capacity available for American experiments. Because all further flights are estimated to cost $250 million each they are now unable to use the laboratory. Up to now the FRG has planned only two flights with Spacelab and these are to be in 1985 and 1988. Thus the development costs have not paid off for the Europeans.

Nor can similar disappointments be excluded in the case of the space station undertaking, as Dietrich Lemke of the Max Planck Institute for Astronomy in Heidelberg writes in the journal STERNE UND WELTRAUM (No 8-9, 1984, p 434). Because in addition to the 25 billion marks which would have to be appropriated for construction of the station it would also be necessary according to initial estimates to provide an annual maintenance cost of 2.5 billion marks in which the Europeans would have to participate. If of this the Europeans were to carry a quarter or a fifth that would correspond to the expenditures for one large research satellite per year. If Europe were to participate in the American space station then Europe would hardly be in a position to continue providing appropriate funds for space research. This is particularly the case since the further development of the successful Ariane rocket must be financed. In addition to this there is the fact that the launching of a satellite from a manned vehicle is basically pure waste. A single shuttle flight lasting only 1 week actually costs about $350 million if one takes into account personnel costs and other "secondary" costs.

Inappropriate Orbit

American calculations of the cost of launching a satellite are much lower only because otherwise no one would want to use the shuttle anymore. Besides, a satellite launched with the space transporter is much more expensive than an orbiting object put into space by means of an unmanned rocket since the construction of such a space transporter would require because of the presence of the shuttle crew much higher levels of safety. The same would apply to measuring equipment on board the space station. In recent years the technicians have learned to produce for most purposes automatically operating satellites which do not require human attention. It would be senseless to allow this capability to languish unnecessarily.

But from the scientific point of view the most deplorable thing about the space station is the fact that it is to move in an orbit which is unsuitable for most investigations. It will circle the earth only at an altitude which will be at most 400 or 500 km. At such an altitude it will fail to meet many scientific requirements. The space station does not rise above the radiation belt of the earth nor does it get outside the magnetosphere. In addition, some of the observations would be perceptibly impaired by contamination in the vicinity of the space station in the form of an accompanying gas and dust cloud and would also be impaired by the "dirt" carried along by the astronauts. Finally, the orbit of the station is to be inclined to the equator only by

28.5 degrees so that the facility never flies over regions of the earth which are situated closer to the pole. Desirable terrestrial exploration projects are therefore excluded from the outset.

Because of the gas and dust cloud accompanying the space station and because of the low altitude which has the consequence that for the astronauts one-third of the sky will be obscured by the earth uninterrupted astronomical observations are possible only for at most 40 minutes. For longer measurements of dim objects it would be necessary to artificially combine several observing phases. Astronomers on board the space station would require a disproportionately large time for reaiming their telescopes.

In recent years the orbits of satellites have largely been adapted in each case to the anticipated program of observations. The X-ray satellite Exosat, for example, moves in an orbit which ranges far from the earth and permits long uninterrupted observations. The infrared satellite Iras for the same reason was able to make a total sampling of the heavens in only 6 months because it circles the earth in a solar synchronous polar orbit. In the case of observations made from the space station it is no longer possible to freely select an orbit. Whether this disadvantage is compensated for by the advantage of being able to do maintenance work on the satellites is questionable.

One argument often abused for the space station is that it is specially fitted for experiments in the biological sciences and in materials science. But here one may have substantial doubts, too. The manufacture of vaccines, electronic components with special characteristics and other products in space, according to a study completed recently by the DFVLR under contract to the German minister of research would make sense, because of the high transport and operating costs, only for products of especially high value which are required in relatively small quantities. But it is by no means the case that "already today products have been specifically identified for which manufacture in space is the only or the most likely alternative." And with regard to biological experiments the study observes: "It is expected that the production process would be largely automatic. Therefore temporary human staffing would probably suffice." In consequence apart from certain exceptions one would not need a space station for these experiments. One can just as well set a much cheaper experimental platform in space and at regular intervals approach it by Space Shuttle. Only for a few experiments is the longer presence of astronauts necessary and therefore only in such exceptional cases would the shuttle be inappropriate since it orbits the earth at the most for 2 weeks at a time.

The Danger of Protectionism

Some scientists are currently counting on advantages in the space station for certain projects which, however, are still far from being planned. These include missions to other planets with the object of returning soil samples to the earth. For such undertakings the space station would be a convenient quarantine location. But if the ESA participates in the American space station then there will be no money available for such planetary missions in Europe so that this argument scarcely has any significance.

Finally in Europe the argument is no longer valid which claims that the space station promotes the commercial exploitation of space travel and that therefore we should participate in it. It has been repeatedly demonstrated in the past that whenever there is a chance of doing business in space the Americans are all too ready to push the Europeans aside. The most recent example of this is the "Landsat Law" which was passed a few weeks ago in the United States. Among its other provisions this law provides that all pictures and data collected on board American space systems must be available for open publication in the United States. This law put an end to the promising Messerschmitt-Boelkow-Blohm project to photograph the earth from outer space and to sell the pictures with exclusive rights to some purchaser. The politicians in Europe who in disregard of the interests of the scientists nevertheless promote participation in the planned American space station should think about that for awhile.

8008
CSO: 3698/618

AEROSPACE

NEW ESA DIRECTOR ON SPACE STATION, MILITARY SPACE

Hamburg DIE ZEIT in German 31 Aug 84 pp 9-11

[Interview with Reimar Luest, general director of ESA, by Christoph Bertram, Guenter Haaf and Heinz Michaels of DIE ZEIT: "Europe Reaches for the Stars--Competition and Cooperation: America's Supremacy in Space Travel Should Be Broken"; date and place not specified]

> [Text] Reimar Luest, born 1923, graduated in physics under Carl Friedrich von Weizsaekker. In the beginning of the sixties he was scientific director of the European Organization for Space Research (ESRO). After that he directed the Institute for Extraterrestrial Physics in Garching. In 1971 he became president of the Max Planck Society. After 1 September Luest will preside as general director of the European Space Agency (ESA).

European astronautics must now make some far-reaching decisions: Should the invitation to cooperate in America's space station be accepted? Or should the "Ariane 5," a superrocket designed to transport astronauts, be built? And perhaps also an all-European space shuttle? Is it possible to finance even one of these projects or both of them--space station and "Ariane 5"?

Just how the switches are set on the track of European astronautics depends largely on our cooperation with and our competition with the Americans. Because even if there were to be cooperation in the manned American space station, the Europeans must still expand the commercial position which they have reached in recent years in the transport of communications satellites and the European rocket "Ariane" must be able to compete for satellite freight against the American Space Shuttle. In addition, the growing presence of Europeans in space harbors military problems even though the programs of the European Space Agency (ESA) and the privately organized satellite shipping service, "Arianespace," serve exclusively peaceful purposes.

In this web of political, economic and scientific interests the ESA faces an important task in planning and coordinating future European space projects. Its new general director Reimer Luest brings with him some experience obtained in early scientific space projects. In the sixties he attracted worldwide attention when in one of the first FRG space experiments he created "artificial

comet tails" in order to study the terrestrial magnetosphere. His new presiding chair in Paris' rue Mario-Nikis could bring him into conflict with his former colleagues. Many space scientists question the usefulness of a swift and massive European ascent into manned space travel. How is Reimar Luest going to bring the discordant interests of politics, economics and science under a single hat?

ZEIT: Herr Luest, on 1 September you enter upon your office as the new general director of the European Space Agency in Paris. European space activities remind one of a patchwork carpet: a little bit here, a little bit there--wherever the Americans have left a gap in the market.

Luest: I don't see it that way. If one looks more closely at the program of the ESA more precisely one sees four fundamental elements. The basis which the ESRO [European Space Research Organization, since 1975 a part of the ESA] brought with it into the ESA in the beginning of the seventies is the scientific program, that is to say, the program for scientific satellites. All 11 member states of the ESA must participate in the latter. It was and is extraordinarily successful; all scientific satellites built by ESRO and ESA functioned.

ZEIT: For example?

Luest: One example is the "Cos-B satellite" which opened the door to gamma-ray astronomy, an area in which the Europeans are distinctly ahead of the Americans. Another example is the X-ray satellite "Exosat" which is still orbiting. The second fundamental element in the program of the ESA is the area of communications satellites. Here experimental satellites for the communications area are being developed, built and operated. This has helped the European industry to be competitive in the marketplace today. The third element is earth exploration in its broadest sense. Admittedly this last-mentioned area has thus far not been used commercially.

ZEIT: Does that have to do with exploration for mineral deposits?

Luest: This includes first of all weather satellites--"Meteosat"--whose work can be seen by every German in the evening on television. Secondly--and a satellite of this type is about to be built--it involves earth surveillance from above, mainly surveillance of the oceans and of ice masses but also land surveillance for the purpose of climate research, environmental stress research and in certain cases also land surveying and exploration for mineral deposits. Navigation satellites are also included here and the ESA has built one of these.

ZEIT: Are these satellites necessarily comparable with those which the Americans have made available for navigation and communications? Or is it just a matter of waving a little European flag in space?

Luest: There have been discussions of this with the Americans. A certain segment is being assigned to the Europeans. Here it is possible to have a sensible division of labor.

And now consider the fourth point in the program, the "Ariane." This rocket was much debated in the seventies. The Europeans had hoped at first that they would receive a guarantee from the Americans that commercial satellites would also be fired aloft. But the Americans were reluctant to give this guarantee. That brought us to the decision to undertake the building of our own carrier rocket.

ZEIT: You said that the European space industry is in certain areas capable of competing with the Americans. Is there to be competition or cooperation?

Luest: Both. With respect to industrial projects it is strictly a matter of competition. But in the area of science there is a broad range for cooperation.

ZEIT: Does the American policy of limiting more and more the transfer of technology to Europe and Japan play a role here?

Luest: European and also German companies have already made some complaints about this in recent months.

ZEIT: Is it not the case that in the scientific area and also in the industrial area the concentration of the Americans upon one big program, namely the Space Shuttle, has given rise to gaps? We are thinking of the Halley Comet probe "Giotto" and the success of "Ariane."

Luest: In fairness it must be first stated that the American space budget for the civilian area is almost by a factor of 10 greater than everything that has been available in Europe in the civilian domain. I am thinking of $15 billion annually available to the Americans. The ESA budget on the other hand is of the order of magnitude of $1 billion. If to this you add the French program and some others you come to about $1.5 billion. But you are quite right, a large part of the American investment has in the last 14 years flowed into the development of the shuttle.

ZEIT: But it is the case that American scientists are deploring the fact that they are unable to send the planned Halley Comet probe while the Russians, the Europeans and the Japanese are each sending their own probe.

Luest: This is a consequence of the way in which the American space budget was divided up during the seventies. But one must not forget that the Americans have played a leading role in all planetary research. Thus far there have been no European projects for the exploration of the planet. The reason for this: a planetary project is very much more expensive than a normal satellite project.

ZEIT: What would we lose if the Europeans were not to be active in space, if the ESA didn't exist?

Luest: First of all I cannot imagine Europe holding fully aloof from an important engineering/technological area. And I say this with regard to our own European industries. German industry has to be interested in being able to develop this type of technology.

ZEIT: You mean as an exportable product, as a source of income?

Luest: Yes. Secondly, I believe that the area of communications is such a sensitive area that over the long term there one cannot rely entirely on the Americans or the Japanese.

ZEIT: We find that still somewhat vague.

Luest: We may be sure that a country which is in a position to build communications satellites will have an influence on determining how communication is to take place and in what regions of the world.

ZEIT: There is INTELSAT, to which most postal administrations belong and in which American private enterprises are also represented. Is it the case that global communication has in any way been influenced by too big American interests?

Luest: It is not just a question of the global area but also of regional aspects. A Frenchman would tell you that there have already been substantial conflicts of interest.

ZEIT: And a German cannot say that?

Luest: Perhaps not as easily.

ZEIT: The "Ariane" program has cost $1.2 billion. For the next 3 years "Arianespace" is figuring on contracts for $750 million. That is not a particularly favorable balance sheet.

Luest: Three years is certainly too short a period for accounting. Besides, it also makes sense economically to avoid giving the Americans a monopoly in the area of carrier rockets.

ZEIT: Most of our arguments to show that it is necessary to become involved in space are not quantifiable. What criteria does one use to say no to specific projects?

Luest: In the scientific domain the easiest answer that occurs to me is to say that there it is originality which counts. If something is not sufficiently original to provide one with something new scientifically then one ought to let it drop.

In the second area, namely communications satellites, one can more easily evaluate what makes sense economically. The chances in the third domain, that is in terrestrial exploration, have, however, been thus far hard to evaluate. There it is more a matter of national interests, public interests; for example, whether one should improve a weather satellite in such a way that the data can be delivered directly into a computer and thus perhaps provide better weather predictions.

Finally, in the area of carrier rockets one may first of all again make purely economic evaluations. Here the question is how big and how heavy in a few

years the satellites will be in the communications area, which is an area where one can obtain actual contracts. Answers to these questions then determine the size of the carrier rocket. In this area it would also be of doubtful wisdom to say "we have the 'Ariane 3' and 'Ariane 4' and now we will cut off development." One can't bracket out a particular area and leave it to the Americans.

ZEIT: The American president has decided to build a manned space station. The Europeans are considering whether they should accept his offer to be participants and what they could prudently do if they did accept the offer. At the same time there exists to some extent very sharp criticism of this program because of doubt whether its economic and scientific goals can be reached.

Luest: I think that individual scientists were a little too precipitate there.

ZEIT: But there does exist political assent, for example, from Bonn.

Luest: I've read that in the paper. More than that I don't know. Nevertheless: it is logical to talk seriously with the Americans about the form which participation might take. In the scientific domain it would involve weightlessness experiments within the context of materials research and it would involve biomedical and pharmaceutical experiments. What makes the problem such a hard one is the fact that thus far it has simply not been possible to estimate the economic possibilities. I think that it would be dishonest to say that without question this will lead to production in space.

ZEIT: Are we correct in understanding that you are of the opinion that at the moment it makes no sense to affirm European participation with the Americans? And that also a general-political assent cannot come about until the exploratory phase and the phase of clarifying this project has been completed?

Luest: No. It wouldn't be possible to do it that way. The design phase can only be carried out jointly and in close agreement with the Americans. Thus one would have to have at the latest by the spring of 1985 a general-political decision in favor of participation.

ZEIT: You don't think that would be a weakening of the European negotiating position?

Luest: It would be a bad thing if the politicians were to say: we don't want to make the basic decision until the end of 1985 and up to then we want to leave all possibilities open. This would certainly not create a good situation for the technicians and for those who have to discuss the program with the Americans. It goes without saying that the conditions which are to be negotiated in the contract must be consistent.

ZEIT: Just how useful is a manned space station if it is necessary to carry out experiments in it which sometimes require such precision that the presence of human beings is deleterious?

Luest: That is a point on which some scientists have immediately expressed doubt. For all astronomical observations every effort will be made to avoid

having people on board because that would certainly be disturbing. Also during many terrestrial observations one will very probably manage better without people. But even in these two domains it is also conceivable that there might be large astronomical observatories which require maintenance in space.

ZEIT: Does it really make a difference whether a station is manned permanently or only temporarily? Which of the two do you prefer?

Luest: The Europeans should keep the option open for themselves of building their own manned space station toward the end of the nineties. Since up to now it has not been possible to estimate accurately how great the potential of a manned space station is the wisest policy would be to at least not exclude this option. It appears to me that it would be possible to pursue such a policy if on the one hand one were to participate in the American space station with one's own contribution—that is, an identifiably European contribution and if on the other hand one could keep open the possibility of developing the "Ariane 5" finally as a manned carrier.

ZEIT: What can the Europeans learn from participation in the manned space station project? Why are we ourselves not in a position to build such a space station?

Luest: The problem confronting any manned mission is first of all safety and reliability; this requires a special types of technology.

ZEIT: What would participation in the Americans' manned space station cost? James Beggs, the chief of NASA, during his European visit in the beginning of March mentioned a sum of about $2 billion distributed over 8 to 10 years as a European share. The Americans on the other hand speak of $8 to $10 billion over the same period of time. Are those only production costs or do they also include the follow-up costs of the system?

Luest: Your question is justified. By the end of 1985 we must also have a clarification of the operating costs and also regarding accessibility. Access to the space station will, of course, only be possible with the American Space Shuttle. This puts us in a situation in which we need to have really solid guarantees from the Americans.

ZEIT: If the Americans say "for $250 million a year you can come aboard" that would be about one-sixth of the total European appropriation hitherto. Is that at all realistic in view of the small size of European treasuries?

Luest: First of all, that is a political decision to be made by the Europeans. Namely, is it sensible to engage in a large transatlantic project which may possibly also have economic consequences? I believe that the answer is yes. Certainly an addition to the European budget will be necessary. But here there exist inequalities. The German budget totals about 800 million marks. The French spend twice as much. German interests would be more prudently served if an attempt were at least made to equal the French in this respect.

ZEIT: How much would have to be added to the European budget?

Luest: The present ESA budget is a bare 850 million accounting units and these translate into about 1.95 billion marks. About 3 billion marks annually would suffice to finance both the European projects and also transatlantic cooperation.

ZEIT: At present there is already some resistance in the German Ministry for Research. They say that that is a political decision and that scientifically and in terms of research policy it is not so clearly justified and that therefore there should be added to the budget of the research ministry a special budget for the space station. What do you think of that?

Luest: Herr Riesenhuber is entirely correct when he says that the space station is a new element and that therefore there should be an addition to the budget of the research ministry. It certainly cannot be financed at the expense of the other parts of the program.

ZEIT: Would you oppose reducing any other budget allowances of the research ministry in favor of the space station?

Luest: That is the way I see it.

ZEIT: Wouldn't it be more logical to invest the 800 million marks of the German budget into the development of superfast trains, into the development of certain sensors or into financing electronic processes?

Luest: I don't think that it is logical to support the building of any individual components, for example, specific sensors. One must employ engineers to deliver a finished product, a finished project. Only that compels them to go to the limits of the technically feasible. Naturally, in this respect a space project is a really special challenge. It is simply the case that a certain fascination is exerted by this area. This is probably the reason why astronomy--a completely profitless science--exercises a colossal attraction for men and this attraction also carries over to space travel.

ZEIT: Is the ESA at any disadvantage because it possesses no manned space flight? X-ray satellites and gamma satellites are very interesting to scientists and are certainly also fascinating. Nevertheless, the latter remains a "cold" art. On the other hand manned space flight sticks in people's minds differently even though the scientists were to claim that this would all be money thrown away. Does this psychological fact explain why people are so eager to join the French in manned space flight?

Luest: There I would have reservations. For me that would not be a decisive reason to ask the taxpayers for money.

ZEIT: You said that manned space flight requires a higher level of reliability. Now any transport to a space station would be carried out by the Americans with the shuttle. The space reliability of a laboratory we therefore have already established, in fact we built the space laboratory for the shuttle. Where is the additional gain? We certainly won't obtain it through the shuttle technology.

Luest: No. The difference between Spacelab and the space station lies in the fact that the latter constitutes a system which is self-sustaining, including its energy supply and including everything associated with energy supply, but Spacelab is firmly linked to the space transporter.

ZEIT: Then Europe is also actually present in space now. What political consequences arise from this for us? What responsibility?

Luest: The ESA is in the fortunate position that in its constitution it is firmly asserted that it may only develop projects for peaceful purposes. This is clearly confirmed by the participation of Sweden and Switzerland.

ZEIT: The military use of space is a second aspect which we did not intend our question to touch upon. Our question is, What will be the consequences for us with respect to political responsibility; how should the regime in space actually develop? Or don't you see this problem?

Luest: Since you have expressly excluded the military area I don't immediately see any political problem.

ZEIT: An example. Geostationary satellites have progressively less and less room in outer space. And so probably quotas will have to be assigned and it will be necessary to make sure that no one deviates from the agreements. Another example. Because of the substantial investments involved we are interested in securing that our satellites are not damaged by collisions with others, by military tests conducted by the other side or by other actions of third countries. Will we be in conflict here with a policy of "open space"?

Luest: No. Space law is already very much developed. There exist binding commitments in international law, for example, with respect to the question of just how densely satellites can be packed in geostationary orbit. This is a question which is of special interest for Europe. Beyond this, the further development of technology aims at being able to make the packing density of satellites in space as high as possible.

ZEIT: Permit us to bring in some military aspects: Where is the dividing line between the European capability of firing the "Ariane 3," a communications satellite, into space and the ability to fire a surveillance satellite into space?

Luest: The capability exists, because the European industries are indeed building these terrestrial exploration satellites for the ESA.

ZEIT: We were thinking more of a military surveillance satellite.

Luest: If the members of the West European Union were to decide to have their own surveillance satellite European industry would certainly be capable of building one.

ZEIT: There is a French program--"Spot"--for terrestrial exploration. There exist metric cameras of German development which evidently functioned excellently on board Spacelab last December. And there is the Boelkow proposal to

produce their own surveillance capability and to simply sell the surveillance pictures. Would it not lead to entanglement among the great powers if the Europeans were to suddenly offer terrestrial surveillance pictures in a civilian program when a jeep or a tank is clearly visible on these pictures?

Luest: I would think it advantageous if this sort of thing were really opened up, which does not exclude ...

ZEIT: ... that you would be somewhat annoyed by it.

Luest: ... the possibility that the military in Europe might declare that they wanted their own surveillance satellites. And I wouldn't find that in the least irrational; must Europe stay completely dependent upon the Americans in this area?

ZEIT: But then you've entered the military domain. Are you ready to place at the disposal of the ministries of defense of the member countries of the ESA those satellites launched under the responsibility of the ESA to make these accurate photographs?

Luest: That would be prohibited by the ESA convention. The ESA is required to publish such pictures without any restriction. And I would wager everything that it will stick to this policy.

ZEIT: The Space Shuttle is also able to collect satellites in space and the Soviets have always said that the Space Shuttle has a "satellite killer" capability. We are participating in an American manned space station which is supposed to have been built exclusively for civilian purposes, but which depends upon a transport system which could also have "satellite killer" functions. Do you see a problem there?

Luest: No.

ZEIT: Can you be military on Monday and Wednesday and civilian on Tuesday and Thursday?

Luest: The space transporter is already being used for military purposes also. It was developed quite consciously by the Americans in this form, too.

ZEIT: In fact, on every Space Shuttle trip some of its chambers are reserved for military tasks.

Luest: Can be reserved. But the entire development of rockets has been initially a military development and did not take place for commercial reasons or any other reasons. We scientists were at that time prepared to make use of this opportunity for scientific purposes. It would have been illogical if we had said: we absolutely insist on using the Delta rocket because that is not being used for military purposes and we refuse to use the shuttle because at intervals it is also being used for military purposes.

ZEIT: But it could happen that in the shuttle one part of the cargo is intended for the manned space station in which the Europeans are participants and another part for military tasks of the United States.

Luest: I consider that in that respect we should and must have a clear separation. I believe that the Americans are also being entirely in the open about this because even for logistical reasons the military usually have other requirements. I find it difficult to imagine that that could really lead to problems. Besides, the Americans have in the meantime produced four Space Shuttles.

ZEIT: The Russians don't know which Space Shuttle is transporting something civilian for the Europeans and which one is transporting something military for the Americans.

Luest: The American public relations are such that they really announce almost everything which is done in the civilian domain.

ZEIT: If we are able to fire satellites into space and into very high orbits then theoretically we can also shoot satellites down. Is that correct?

Luest: Yes.

ZEIT: That means that in this civilian development we also have a potential military development.

Luest: I believe that the French have always looked at the matter that way. In spite of this I would hope that having defined the reconnaissance area as a purely defense area it would be possible to come to some agreement for the other areas prohibiting the use of space in this form for military purposes.

ZEIT: But now one may see on both sides in the Soviet Union and in the United States an inclination to do precisely the opposite--to prepare means to convert satellites to military use. What are we doing to protect our satellites against that?

Luest: Absolutely nothing, because thus far we have not anticipated the situation.

ZEIT: Doesn't it compel us to find ways of protecting ourselves?

Luest: The ESA is developing only satellites for peaceful purposes. Therefore I would initially give no high priority to this problem.

ZEIT: We are not talking about the ESA but rather about your ideas. It is certainly very disturbing and for many people also very surprising that something which is made out to be entirely civilian would also be usable in a military way.

Luest: But that is certainly true of many areas. Electronic developments are used for military purposes. That is something we can't get away from.

ZEIT: But here we have a European agency which provides funds and promotes programs and does all of this and must do all of this under the aegis of purely civilian use while all along it is also helping to advance the military use of space.

Luest: That is certainly indisputable. But that is true, if I may repeat myself, not only for the domain of space. Inventions can also be used in one or the other direction. This possibility can be excluded for no industrial development.

ZEIT: The launching center of Kourou in French Guayana is operated by the national French astronautics organization CNES and the French have a strong military interest in this. Would it be conceivable that conflicts might arise and that the French for national military reasons might use this astronautic center more intensively and perhaps even want to have access to the "Ariane"?

Luest: That possibility cannot be excluded. But I would imagine that in such a case it would be necessary to come to some reasonable understanding.

ZEIT: In February in Den Haag President Mitterrand proposed the construction of a manned space station for Europeans for purposes of reconnaissance. This idea has met with a certain degree of approval within the German Federal Government.

Luest: I must admit that I do not consider myself competent to say what one could do with a manned military station.

ZEIT: But as a scientist you could certainly discuss the logic of a reconnaissance station forced to move in a polar orbit if at the same time you reflect on the fact that the crew of this station would be exposed to high radiation stress?

Luest: I don't know what the military have had in mind there--possibly they may have special plans which I am not familiar with--nor do I know anything else that might be in the background.

ZEIT: President Mitterrand also made his proposal because once again there would have to be "a sort of technological purpose." Many of the arguments which you have brought forward for the civilian use of space can also be adduced for military projects: that industry and science, engineers and technicians would be committed to a specific project and in this way would also establish a link with world technology. One could take over your remarks under this heading almost entirely and use them also to justify military things in space.

Luest: It would be unworldly not to recognize that a great part of the American technological developments has received an impulse from military projects and that in this way American industry is more intensively subsidized than European industry and this is certainly something which can lead to advantages in competition. Nevertheless, to me this would not be an argument for saying "now let us Europeans also intensify our military efforts." It is precisely

for this reason that it appeared to me to be more sensible to promote such technological developments within the civilian area.

ZEIT: Technological developments which have military usefulness.

Luest: This is something which as I have said is quite impossible to exclude in other areas also.

8008
CSO: 3698/618

HOW VW AUTOMATED ASSEMBLY OF NUMEROUS GOLF VERSIONS

Stuttgart BILD DER WISSENSCHAFT in German Aug 84 pp 60-62, 64, 66, 69, 72-73

[Article by Lutz Ruminski: "Robots at VW"]

> [Text] The workshops at VW do not resemble the Japanese "ghost factories." But nevertheless a quarter of all work in the final assembly of the Golf is performed by robots. These are, in particular, the stressful and monotonous activities. The robots were built by the VW technicians themselves.

The car body passes point M 1. The timing begins: a scanner reads a model label, the label's coded message is delivered to the large-scale computer MONTIS--standing for "Assembly Information System." MONTIS knows everything about the parts which are used in the final assembly of the new Golf:

It has at its disposal data as to what engine, what transmission, what tires and what special equipment must be combined with the basic structure. As soon as a car body has been recognized by MONTIS on the first floor of the new Building 54 of the Wolfsburg VW Plant there begins the assembly of that appropriate transmission which alone can be installed in this one body type.

It is here that there emerges one of the greatest problems confronting the Wolfsburg people when they planned their "robot shop" and it was a problem which probably would have been insoluble without the help of a computer. With the multiplicity of model variants, starting with 16 colors, two-door models and four-door models with and without sun roof, different battery powers, gasoline engines, diesel engines, turbo engines and injection engines in large and small versions, four transmission types in aluminum housings and magnesium housings, wide and normal tires, spare tire variations and headlight variations it can easily happen that wrong combinations can be produced. For the new Golf model there are thousands of variants. "We once calculated," reports Friedrich Luenzmann, manager of manufacturing planning for the painting and assembly departments and an important participant in planning the mechanization of Building 54, "that the same car comes off the assembly line only once every 14 days"--and this, let it be remembered, is with production figures of almost 3,000 vehicles daily.

It is clear that with such a variety of dimensions it is not possible to carry out production "by guess and by gosh." Every car that leaves the plant has been put together in response to special customer requirements and at the moment when the car body is being finished it is already destined for a specific Mr John Doe as recipient.

The first FRG step in this direction began in Wolfsburg in 1983. Volkswagen had availed itself of the opportunity to manufacture its best-seller "Golf" (after the already legendary "Bug" the most widely sold Wolfsburg car) in still greater numbers. This was to be carried out while employing the most modern technology to produce an even more perfect and elegant car in a newly built manufacturing shop bearing the number 54. The aim was thereby to meet the increasing demand and at the same time counter the increasing pressure of the Japanese competition. To this end the final assembly of the vehicle was thought out anew from the ground up and was rendered more efficient.

While for the first version of the Golf only 5 percent of all final assembly operations were mechanized it is now as much as 25 percent. Building 54 with an area of 120,000 square meters distributed over two floors has become a synonym for the "factory of the future." Nevertheless, the horror fantasy of a factory building empty of people has been avoided: the approximately 40 industrial robots in this Wolfsburg plant are working shoulder to shoulder with 4,000 employees. It is not by any means a case of vanishing people.

Volkswagen, the largest domestic automobile company, employees 232,000 people worldwide and in 1983 had an annual turnover of 40.1 billion marks. As early as 1972 Volkswagen began to consider the use of manufacturing automata. Their great advantage for the Wolfsburg planners would be the fact that they can be multiply employed to handle a broad and steadily increasing spectrum of products without the necessity of building a special manufacturing installation for every vehicle type. Instead, once equipment has been acquired it can be further used after a suitable reprogramming even after the expiration of an old series of models.

In consequence of these considerations robot models available on the market were tested for areas of use specific to Volkswagen with the result that the Wolfsburg car experts decided not to purchase industrial robots but to build them themselves. These would be industrial robots capable of standing up to the high demands of vehicle manufacture and which could be reprogrammed and converted whenever necessary without having to have recourse to the services of an outside supplier.

In addition to high flexibility and easy programmability it was from the outset the goal of these plans to create equipment which "is constructed simply and with high rigidity, which can be assembled in every position out of simple and largely maintenance-free structural elements, would exhibit a repositioning capability with a tolerance of plus or minus less than 1 mm and which would be capable of supporting loads of between 15 and 100 kg." Thus there arose in Wolfsburg the first and then later the second generation of in-house robots.

The areas of employment of the robots range from machine loading, the assembly and manipulation of components along welding lines down to spot welding itself--which is by far the most important area. The greatest portion of industrial robots (484 in number) are in the Wolfsburg VW parent plant. By 1990 according to Volkswagen's prediction about 2,000 automata will be "employed" by the car manufacturer.

The real novelty which--with regard to the final assembly of the Golf in Building 54--has given Volkswagen the reputation of being the most progressive automobile plant in Europe lies in the combination of a number of technologies which are so attuned to one another that relative to the present status of technology it has been possible to achieve an almost optimal level of efficiency. The whole thing was possible only because it was not merely an existing area of the plant that was modernized but rather an entirely new company component was constructed.

In 1978, 5 years before the beginning of mass production, planning commenced for the new Golf. The initial idea was followed by the first prototype. Then finally the decision was made to start up mass production. But, of course, to begin with the Volkswagen designers and planners were confronted by problems which up to then had been unknown. Because along with the new Golf there also came new machines for its assembly and in order to operate these machines it was necessary that the employees first be trained.

While previously it had been primarily in such areas as carcass work and pressing work that human beings had been replaced by machines (both for efficiency and for humanitarian reasons) now the domain of assembly was included. This was because the numerous complex steps involved in assembly can now hardly be dealt with without freely programmable control systems.

In the view of the VW planners the new Building 54 represents "only one component" of the new Golf design. But this component involving as it does investments of 548 million marks of which 221 million are in the domain of mechanization is the greatest and the most important component. Altogether VW has invested 2.1 billion marks in the new model series.

As in the past so in the case of the new Golf the manufacture of individual parts is accomplished through division of labor. The number of these parts totals about 10,000: the transmission comes from Kassel, in four- and five-stage versions, for large and small engine types and also in an automatic transmission version. The shock absorbers of the vehicle originate in another shop of the Wolfsburg plant, the rear engine in a plant in Salzgitter. Everything is delivered directly to Building 54 and is there immediately installed without extensive stockpiling.

To return to the assembly: the car body reaches Building 54 after having run through carcass work and the painting shop and is stored in a body storage having a capacity of 1,000 pieces. It is at this point, namely the arrival of individual parts from other plants and the arrival of the finished car bodies, that there commences the actual history of the new assembly technique which now exists in Wolfsburg.

In response to commands by MONTIS the engine block, drive shafts, supports and brackets are extracted from storage and fitted together. In parallel to this the engine moves along on the conveyor after an optical barrier has once again verified that it is the correct engine variant. At this point the industrial robots are also put to work. In Building 54 they are not only concerned with the assembly of the new Golf, but are also designed to deal with the VW model "Jetta" which is carried along with the Golf on the conveyor belts in an "arbitrary mixture."

On the ground floor the V-belt pulleys and the generators are mounted onto the engine block, the generator is screwed into place and the V-belts, selected by the robot for the particular engine concerned, are put into position and stretched. Finally the transmission and the rear engine, preassembled in parallel, are fitted together. This is a difficult task for the robot because the gear teeth must be meshed and the assembly unit must be repeatedly explored from all sides until transmission and engine are properly adapted to one another.

There then follow the final steps and it is here that a peculiar feature may be seen which was necessitated by the mechanized manufacturing of the new Golf. The preassembled drive system now also equipped with drive shaft is placed on an underframe:

Formerly it was necessary to install all structural components individually into the car body and then link them together, but today the entire chassis, apart from a few individual parts and conduits, is integrated into the car body all at once. All that remains to complete the work on the ground floor is the installation of two shock absorbers, then the transporting frame with the now complete drive system is moved to the second floor and placed in an intermediate storage.

During all this the workers and the robots have been working busily on the car body. Thus in the meantime the battery weighing as much as 20 kg has been positioned and screwed into place, the assembly of the brake fluid lines and fuel lines has been completed and at each station there have been repeated checks to determine whether the parts have been fitted accurately to one another and properly installed, to determine whether the tolerances are right and whether the assembly has been taking place in the prescribed time.

Because exactly 265 minutes after the car body has passed point M 1 the drive system has reached the second floor. If the corresponding car body isn't there at this point in time then there is an error announcement and the entire installation comes to a halt. The total assembly time for the drive system amounts to 145 minutes. If one calculates the transport times from the individual manufacturing points there remains very little for waiting times and storage. Perfect timing is essential.

The big moment comes along 265 minutes after the start. The workers call this the "marriage": the drive system is united to the car body. This is done with millimeter accuracy and automatically without any need for a worker to pilot the engine.

But at this point the car is still far from complete. Robots are again employed to install the exhaust system and the gas tank, to assemble the tires and the spare wheel, to fasten the front end and grill and the headlights and to assemble the end frame as well as the rear buffer shank.

In order to keep things running smoothly during the assembly each small control loop has been provided with its own computer. Thus, for example, ATSC 3, AMOR or AGET keep watch to secure that the correct tires, the correct engine or other parts are put into the correct automobile. If one computer fails its replacement is automatically switched on and if this latter also gives up the ghost then there are always MONTIS and other large-scale computers in the plant to take over coordination. Just to account for the abundance of possible situations alone requires a computer. Because it is hardly possible for a mere mortal to rapidly combine and install in a matter of a few minutes five-unit and four-unit sets of tires, with and without a spare wheel, steel rims or aluminum rims, as wide wheels by Conti or by Pirelli, etc.

With extreme accuracy 300 screws are automatically assembled onto every Golf and 720,000 screw fastenings are performed every day. Screws are employed which are not obtainable on the commercial market. The Wolfsburg automobile builders found that here the tolerances of conventional components were inadequate. In cooperation with the suppliers special screws were developed which--upon their arrival in Wolfsburg--have been repeatedly checked. Even among 1,000 there is no screw which is precisely like another within a tolerance of a tenth of a millimeter.

In order to avoid transport damage 5-kg sacks holding only relatively few screws were selected. The screws are run through a sorting tray and checked for head length, thread and shaft length. They are then transported through pipes as much as 35 meters in length to the screw fastening location. During screw fastening the torques and tolerances can be tested and documented so that in the event of a later problem it is still possible even after the expiration of months to repeat each individual automatic screw fastening process. If a screw has not been optimally manufactured then any irregularity is detected electronically, the assembly is stopped and not resumed until the signal has been given by the manager of the assembly line.

As the last phase of the final assembly of the Golf, no longer located in Building 54, there commence phases of work which up to now it has been impossible to perform in a mechanized manner. But in the opinion of experts these operations have potential for mechanization in the future.

These operations include, for example, installation of the seats which is a difficult activity for the workers but which still cannot be taken over today by robots. The same applies to the installation of the dashboard, the windshields and the inner upholstery of the roof. The latter may one day be glued on automatically. All in all, it is possible that by 1990 there will be an increase in the level of mechanization from the present 25 percent to possibly 30 or 33 percent. Only then will the potential offered by the present state of technology have been exhausted.

In the visible future there will probably not be any factories without human workers in the automobile industry of the FRG. But a glance at Japan shows that the disappearance of human beings from vehicle construction is a possibility which must not be excluded. For example, Nissan-Datsun, the third largest automobile manufacturer in the world, only last year unveiled manufacturing facilities having a 97-percent level of automation. There in two shifts 12,400 industrial robots produce 35,000 passenger cars and trucks month after month.

If one asks Friedrich Luenzmann of VW in Wolfsburg where the particular difficulties in the planning and construction of Building 54 arose then this robot expert mentions three areas:

i. the pure technology of mechanization;

ii. "hand-in-hand development so that the worldwide automobile Golf will not become more expensive and so that not only in Wolfsburg but everywhere in the world in other Volkswagen plants it will be possible to build identical models even when a high level of mechanization is not locally available";

iii. the logistics and the software which guarantees that in Building 54 the right part is in the right location at the right time.

It goes without saying that in the initial phase, particularly with regard to the third point, there were childhood illnesses. For example, in one case no one noticed that the rear hood of one vehicle had been inadvertently closed. This didn't bother the robot, which simply installed the spare wheel right on top of it. But in the end, according to Luenzmann, there were "no problems which we could not solve."

The principle of humanization was and is an important argument to justify industry's introduction of rationalization measures and replacement of men by machines. In the Volkswagen case just a glance suffices to show that this has worked out over and over again to the advantage of the employee. Thus whereas formerly an assembly line worker had to laboriously and tediously assemble the brake controls of the vehicle in an overhead position today this is done by a robot. The fuel tank, which is also installed from below, need no longer be fastened by hand. The same applies to the fuel lines.

Thus rationalization has helped some people, but in the last analysis it has also had the result that about 1,000 employees are no longer required for building the new Golf in the Wolfsburg plant and according to VW they have either found a new area of usefulness in the plant or have availed themselves of the early retirement rule which is in effect at VW. The so-called worker density per work cycle on the conveyor belt dropped in Golf final assembly as a result of mechanization in Building 54 from 4.5 (at peak times even 7) to a maximum of 3 workers.

But that humanization evidently does not carry with it purely positive effects is demonstrated by an investigation conducted in 1979 in which inquiry was made at Volkswagen as to the social effects of robots. The study was initiated by

the Sociological Research Institute in cooperation with economists of the University of Bremen. This study was occasioned by the project entitled "New Manipulatory Systems as Engineering Aids in the Work Process" which was carried out by VW with support from the Federal Ministry for Research and Technology. According to the Bremen study jobs involving especially onerous activities are "usually held by employees who have been through only a short period of training" and nevertheless "these jobs have become a central topic of dispute with regard to a more humane configuring of labor."

This therefore makes it difficult for the entrepreneur who is engaged in rationalization of production to guarantee that the employee always obtains another "higher-quality, or at least equivalent-quality" job within the same factory.

In addition, the Bremen investigators asserted: "The persons immediately affected whose activities have been taken over by an industrial robot are not infrequently transferred to jobs which feature similar or even worse stresses. Apart from this circumstance there is also the fact that in those facilities where industrial robots have been employed it has even been in part the case that there has been a substantial resultant deterioration in the work situation."

Thus "in a relevant number of cases" there has been observed an intensification of performance "which has on the one hand been a consequence of an increase in quantity output made possible by the use of industrial robots and on the other hand has been a consequence of the fact that the industrial robots have only taken over the primary function involved in some activity." "Industrial robots are universally usable motion automata having several axes whose motions can be freely programmed (that is, without mechanical intervention) and in certain cases sensor-guided with respect to motion sequences and paths or angles. It is possible to equip them with calipers, tools or other manufacturing devices and they are capable of carrying out manipulatory or manufacturing tasks."

These are the words which appear in the VDI Guidelines under the heading "Assembly Technique and Manipulatory Technique"--a simple definition for a technically very complicated device which is in increasingly widespread use. In the FRG at the beginning of 1983 there were about 3,500 industrial robots being used. Today the figure is far above 4,000 and the curve is rising.

VW is producing its tailored robots--up to now 1,200--almost entirely for its own use and of these there are a total of 8 different types. The greatest space is taken up by 615 robots of the model R30 variety. Equipped with 6 degrees of freedom this is a device which according to the VW description is capable of "executing in the smallest space all motions occurring in the normal production process.... The device can handle glass components as carefully as it manipulates heavy rear axles in an automatic welding device."

A broad palette costing any interested purchaser a heap of money. Depending upon the number and type of installed motion axes and depending upon the control system as well as the tools required an industrial robot by Volkswagen

now costs on the average 180,000 marks. At the present time there are 83 robots working in non-VW companies. With regard to follow-up costs the device is economical. Annually only 10,000 to 15,000 marks need be spent, depending upon the type of robot, for maintenance and repair of the robot.

Once the robot has been finally assembled its "learning process" commences. In the in-house "Robby Kindergarten" the machine learns the activities which it must later perform and tests are carried out to determine whether the facility is capable of withstanding the most severe stresses and also whether it operates after steady use all day with the same precision which it possessed at the first minute.

Without any exceptions each device passes such a test lasting 100 hours and involving a special test program which prescribes various manipulatory techniques and working speeds. The specialists are not content merely to have statistical samples because breakdowns can have devastating consequences in the course of production.

The Wolfsburg planners are also giving thought to the future of robots. Thus manufacturing automata are now in the laboratory stage which are capable of controlling themselves: they recognize that a screw which they have just finished turning does not "seat" properly and they eliminate this error autonomously. It is expected that such systems will be ready for use sometime in the nineties.

8008
CSO: 3698/598

A320 PRODUCTION UNDERWAY, AUTOMATED METHODS USED

Paris REVUE AEROSPATIALE in English Sep 84 p 11

[Text]

Preparatory work for the production of the A320 is progressing steadily and according to schedule at the various partners' plants throughout Europe and some elements of the first aircraft can already be seen.

At Aerospatiale's factory in Nantes (French Atlantic coast), the machining of components for the first A320 center wing box started in April and assembly will begin in November 1984. This section of the aircraft is the first major element of the airframe for which components have been produced.

At the other partners' plants mock-ops of various kinds are being produced. A wooden mock-up of the center fuselage section is under construction at MBB's Hamburg factory as a design aid to evaluate best use of available space for systems component installation.

A metal engineering mock-up of the center and rear fuselage is also being constructed in Hamburg, while at Aerospatiale's St-Nazaire plant an engineering mock-up (1 : 1 scale) of the complete forward fuselage section including the cockpit is being built. These engineering mock-ups are used as a production aid in order to check the installed accuracy of parts and components, to produce master templates for production piping and to demonstrate ease of access for maintenance purposes.

A design mock-up of the A320 cockpit has also been constructed at Aerospatiale's Toulouse factory.

At Filton (close to Bristol), where the British Aerospace Airbus operation is now based, the metal static-site for the A320 wing is being built. Once completed this site will be used as master gauge on which the movable parts of the wing (slats, flaps, spoilers, ailerons) will be adapted. A wooden design mock-up of the wing is also under construction at Filton. Machining of components for the first A320 wing is to begin in August.

Finally a full scale commercial mock-up is also being built by MBB at Hamburg. Once completed, this wooden mock-up will be flown by Super Guppy to Toulouse for installation at Airbus Industrie's headquarters in Toulouse next October. It will be used for presentations to customers. A second commercial mock-up will remain in Hamburg, where MBB continues to be in charge of the commercial installation.

Selection of equipment suppliers is proceeding and should be completed by the end of August/early September. Amongst the major ones, Dowty has been selected as supplier of the main landing gear.

With regard to engines, Airbus Industrie can now make firm proposals for two high performance engine types: the CFM56-5, efficient derivative of the well proven CFM56 produced by CFM-International, and International Aero Engines' new V2500. First deliveries of the A320 with CFM56 engines are scheduled for the spring of 1988, followed one year later by the V2500 powered aircraft. □

CSO: 3698/36

BRIEFS

JAPANESE SUPERCOMPUTER AT SIEMENS--Munich (pi)--In the new VP 100/200 vector computers, Siemens AG, Munich, offers a tool for solving extremely large numerical problems in the commercial and technical-scientific fields. The maximum processing rate of the Fujitsu-developed supercomputer is 500 million floating-point operations per second. The two models are based on pipeline architecture with multiple pipeline units and both consist of a scalar and a vector unit. At the lowest expansion level, the model VP 100 possesses 32 MB of main memory, which can be expanded to 256 MB in the Model 200. The two computers differ also in the sizes of the vector and mask registers. The cycle time of the vector unit us 7.5 nanoseconds, according to Siemens. Siemens also says that the new large computers can be integrated into the environments of the 7.800 main-frame series. The purchase price for the new VP system begins at DM 16 million for the Model VP 100 with 32 MB and 16 channels. The startup lease price for software (VSP operating system and associated products) is about DM 50,000 per month. Initial deliveries are planned for the first quarter of 1985. /Text/ /Munich COMPUTERWOCHE in German 21 Sep 84 p 2/ 9160

CSO: 3698/25

BRIEFS

ROBOT SOFTWARE AT FRG UNIVERSITY--Berlin (vwd). The Institute for Machine Tools and Manufacturing Engineering at the Berlin Technical University will redouble its efforts in the development of computer programs for seeing and feeling robots. As announced by its Director Prof Guenter Spur, the institute will develop for the "software of the 1990's" microprocessors which can operate 150 times as fast as today's chips. /Text/ /Leinfelden-Echterdingen EEE in German 14 Aug 84 p 12/ 9160

CSO: 3698/25

SIEMENS, PHILIPS JOINT VENTURE FOR MEGABIT MEMORY CHIP

Zurich NEUE ZUERCHER ZEITUNG in German 12 Oct 84 p 15

/Article: "Intensified Cooperation Between Siemens and Philips on Way to Megabit Component"/

/Text/ Munich, 10 Oct (REUTERS)--The two large European manufacturers of microchips will distinctly intensify their cooperation in research and development in this area. Now that the Netherlands Government has followed the lead of the German Research Ministry in making funds avialble for research support, Siemens AG (Germany) and N. V. Philips Gloeilampenfabrieken (Netherlands) will proceed jointly to develop a superchip with 4 million "yes, no bits." The development of what is called the megabit component will require an expenditure of about DM 1.5 billion according to information from the German Research Ministry. But with this, the European chip industry will make a big jump forward by 1989.

The German Research Ministry will subsidize the joint venture with a sum amounting to about DM 300 million; about DM 200 million will come from the Dutch Government. According to further statements from the Bonn Research Ministry, Siemens will allow the joint venture costs of about DM 600 million while Philips will allow about DM 500 million.

Siemens will, according to a company spokesman, bring its experience in the development of 4-megabit dynamic components; Philips has experience in the development of 1-megabit static components. According to Siemens, the cooperative effort will be limited to the research and development level; a joint research laboratory or a joint factory is not planned.

The joint venture with Philips is being carried out at Siemens within the framework of what is labeled the Megaproject which is aimed at production of the 4-megabit chip in about 1989. The chip will replace 64 units having a capacity of 64 kilobits and enable distinct advances in telecommunications, for instance. The Munich company has been working for a long time with other companies in the semiconductor field. In this connection, Siemens has been involved at the development level since 1976 with the American semiconductor firm Intel Corp with which IBM is also associated.

9160
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SCIENTIFIC AND INDUSTRIAL POLICY

ESPRIT PROGRAM STIRS WIDE INTEREST IN EEC

Duesseldorf VDI NACHRICHTEN in German 27 Jul 84 p 1

[Article: "Esprit Program Encounters Big Response: EEC Research Policy Aims at an Improved Industrial Competitive Position"]

[Text] "Esprit," the information-technological program of the European Economic Community countries, has met with widespread interest. Altogether in the first year of support for the program (1985) 441 applications have been submitted by 1,304 participants (entrepreneurs, research institutes, advanced schools) with a total volume of almost 1 billion ECU (2.2 billion marks). There are 110 proposals on the select list. In the next 5 years it is expected that Esprit will be funded with 750 million ECU supplied by the EEC. It is also expected that industry will contribute the same sum.

In the words of EEC commissioner Count Etienne Graf Davignon the Esprit program is a model for the new research and technology policy of the community. The essential features of this policy are the encouragement of cooperation and coordination, joint research, production and joint use of infrastructure (large-scale equipment), creation of a European market and the uniformization of norms and standards. The largely harmonious economic policy of the most important EEC countries which prevails at the present time leads Davignon to hope that by establishing favorable framework conditions and through concentrated purposeful action it will be possible to put into effect the advantages of jointly conducted research and development.

But it is true that Davignon while recently speaking to German journalists in Brussels expressed a fear that the Council of Ministers could use Esprit as an excuse to avoid commencing or further pursuing the numerous other programs which have been introduced by the commission in the last 1.5 years. These programs also include the "action lines" which have been proposed to the commission in the area of telecommunications. The general goal of "improving the competitive position of industry" which is currently the focus of European research and technology policy encompasses in addition a new biotechnology program and a program of "basic research for Europe's industrial technologies" (Brite).

According to the views of the EEC commission this program, which is also designed to promote cooperative projects in the precompetitive area, should

commence this year. It is expected that 170 million ECU will be appropriated for it out of the EEC budget. However, at the last session of the Council of Ministers of Research on 18 June only preliminary formulas were discussed. The FRG insists primarily that before all else Esprit should be put into motion and that the new program for the joint research agency of the EEC and the continuance of the fusion program should be guaranteed. It is the position of the FRG that only then will it be possible to talk about further programs and to agree upon an appropriate choice of financial possibilities.

8008
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FRG PROGRAM PROVIDES ADDITIONAL DM 300 MILLION FOR R&D

Duesseldorf HANDELSBLATT in German 27 Sep 84 p 1

[Article: "The DM300 Million To Benefit Mainly Medium-Sized Enterprises"]

[Text] Bonn, 25 Sep--It is mainly the small and medium-sized enterprises with personnel-intensive research that are to receive additional development resources. This is provided for in a program passed by the Federal Government on Wednesday.

Through 1988, according to the program, DM500 million will be spent in addition to the DM1.58 billion already included in the medium-term financial planning as grants for personnel costs.

The additional resources are meant to give medium-sized and small enterprises incentives to consolidate and extend their research and development potential so as to create better preconditions for product and process innovations, declared Federal Research Minister Heinz Riesenhuber following the cabinet meeting. It is mainly the medium-sized firms doing personnel-intensive research that are to receive support in adjusting to changes in the economic and technical structure, because these firms are benefitting less from the relevant tax concessions.

The goal of the supplemental program is to expand the number of enterprise personnel involved in research and development through additional hiring. The Federal Research Ministry, which is responsible for this supplemental program, is reckoning with 3,000 additional jobs for the new research personnel. The coordination between both types of promotion in the area of research and development results in the following overall changes:

--The promotion will be limited to a maximum duration of 8 years for all firms.

--The promotion rate is reduced from 40 to 25 percent for enterprises that have already been receiving a subsidy for 5 years.

--Only two-thirds of the expenditures for auxiliary technical and scientific personnel will be considered rather than the full amount.

--As was recently announced in the government report on information technology, so-called software companies will be brought into the promotion for the first time.

Enterprises in the production industry including software companies can apply for the supplemental promotion program as long as they have fewer than 3,000 employees and annual sales of less than DM300 million.

The additional promotion is to be handled by the Working Group for Industrial Research Associations (AIF) in Cologne, which has heretofore also handled the subsidy program for personnel costs of the Ministry of Economics. In the future, both measures can be applied for with a form at the AIF. According to the Research Ministry, it is expected that the application documents can be obtained at the AIF after the end of November. The promotion of the hiring of additional personnel begins 1 January 1985.

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SCIENTIFIC AND INDUSTRIAL POLICY

FUNDING, PROGRAMS FOR LARGE FRG RESEARCH ORGANIZATIONS

Duesseldorf HANDELSBLATT in German 2 Oct 84 p 5

[Article: "Massed Concentration and More Concentration"]

> [Text] Duesseldorf, 1 Oct--At its latest meeting, the Commission of the Federal Republic and the Lands for Educational Planning and Research Promotion decided to increase the 1985 joint grants of the Federal Republic and the Lands to the German Research Association (DFG) by 3 percent over 1984 and to increase the grants to the Max Planck Society by 3.7 percent.

In 1985, the Federal Republic and the Lands will provide the DFG with DM948 million. Of this total, DM630 million will go to general research promotion and DM303 million will be for special research areas. The DFG is receiving DM15 million to award Heisenberg Scholarships. The Max Planck Society, as the most important supporting organization for basic research, will receive a joint grant of DM787 million in 1985. Included in this sum are initial resources for a new Max Planck Institute for research in the area of institutions-analysis. In the latest issue of its INFORMATION AUS BILDUNG UND WISSENSCHAFT (9/84), the Federal Research Ministry struck a balance of the previous promotion of special research areas at the universities and explained the developing changes.

Of the 60 special research areas that were established in the years 1968 and 1969, 16 are still in existence. With a few exceptions, they are also in the final phase. This is in accordance with the recommendation of the Science Council on the duration of the promotion of special research areas. According to this recommendation, a promotion for more than 15 years is to be considered only as a temporally fixed final phase.

Much Movement in the Program

According to the decisions of the DFG, it is already clear that of the 131 special research areas now being promoted, at least 55 will be concluded in the years 1984 through 1986. In contrast, there are a great many initiatives for the same time period to establish new special research areas.

Even if all of them were not realized, it can be seen that the total number of special research areas worthy of promotion will increase in the coming years

and that this increase will be greater than the expected financial growth rates for this program.

The main emphasis of the program is on the life sciences. The humanities have only a relatively small share. Other DFG promotion instruments are obviously more effective here.

The special research areas serve not only to concentrate researchers and resources at the individual universities. The program clearly shows that the initiatives of several universities are concentrated in a number of areas: in the life sciences, there are in each case several research areas working in the field of heart and circulation research, on the basic problems of cancer research, in molecular biology and genetics, and recently in membrane research.

Eleven Areas at the Munich Technical University Alone

In the earth sciences, special emphasis is on ocean research. In the engineering sciences, several special research areas are involved with new forms--from process engineering and programming technology to flexible automatic production processes--and with methods for saving energy and raw materials and production processes that preserve the environment.

In mathematics and in polymer research, special research areas formed the basis for new Max Planck institutes.

The university with the most special research areas (11) is the Technical University of Munich. It is followed by Aachen with 10 special research areas at the present time. At both universities, the special research areas are obviously seen as a particularly suitable means for interdisciplinary cooperation by the natural and engineering sciences, including medicine at Aachen.

The necessity of ending as a matter of principle a special research area after 15 years is based not only on financial policy. As a whole, states the article, it does not serve our system of promoting science if, notwithstanding a periodic external appraisal, claims are indeed established for a quasi-institutional long-term promotion. According to the experience to date, there is a great deal to be said for not letting the program of the special research areas go stale but to keep it open, even with limited financial resources, as an opportunity for the concentrated promotion of new research installations.

Opportunity for Young Scientists

With respect to the establishment of 16 new special research areas by the DFG, Federal Research Minister Dr Dorothee Wilms accounted for the importance of this program by saying, among other things, that it:

--Promotes concentration at the universities and also makes it possible to apply the resources at the universities for complex and costly research.

--In view of the strict allocation criteria of the DFG, the program contributes to competition among the universities and also makes it possible for the new

universities, such as now in Bayreuth, Duisburg, Eichstaett and Osnabrueck, to participate equally in this competition and to distinguish themselves.

--The program provides the opportunity for almost 3,000 young scientists, who are paid from the resources for the special research areas, to collaborate in the research installations, which internationally as well are seen as particularly important.

Resources Allocated for Special Research Areas Since the Beginning of the Program (in millions of DM)

	1968	1969	1970	1971	1972	1973	1974	1975	1976
Federal Republic	1.0	11	42	60	86.7	128.9	124	126	141.5
Laender	0.4	10	21	30	43.3	55.0	62	63	60.6
Total	1.4	21	63	90	130.0	183.9	186	189	202.1

	1977	1978	1979	1980	1981	1982	1983	1984	1985
								Projected	[3]
Federal Republic	147	166.2	176.1	186.7[2a]	198	205.9[2b]	214.2	220.6	227.3
Laender	63	55.4	58.7	62.3	66	68.6	71.4	73.6	75.7
Total	210	221.6	234.8[1]	249.0[2a]	264	274.5[2b]	285.6	294.2	303.0

1) Including DM24 million in federal resources and DM8 million in Land resources not called for
2a) Less DM9 million surplus (paid in 1982)
2b) Including DM9 million surplus from 1980
3) Proposal of the Committee for Research Promotion of the Federal Republic-Laender Commission for Educational Planning and Research Promotion.

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FRANCE'S CRESSON ON ELECTRONICS, INDUSTRIAL MODERNIZATION

Paris LE QUOTIDIEN DE PARIS in French 19 Sep 84 pp 2-3

[Interview with French minister of industrial redeployment and foreign trade, Edith Cresson, by Sabine Delanglade and Eric Lecourt: "Edith Cresson to 'LE QUOTIDIEN': 'Priority to Electronics'"; date and place not specified]

> [Text] While Laurent Fabius inaugurates the SICOB Show [International Data Processing, Communication and Office Organization Show] at La Defense, Edith Cresson is pleading today for French ambitions in the electronics and data processing sectors.
>
> The electronics sector set up by Jean-Pierre Chevenement provided for FF 140 billion to be invested over 5 years. This program is not thrown back into question, Edith Cresson, minister of industrial redeployment and foreign trade, assured LE QUOTIDIEN. The woman who calls electronic components "the oil of this decade" has no intension whatsoever to sacrifice the future in order to save ailing sectors.

[Question] Your mission is to "modernize" the French industry. Data processing and advanced technologies will probably be your main tools. To develop these, would you say that the "electronics sector" program is still valid? Is the FF-140-billion budget that was to be devoted to it still up-to-date? How would it be distributed?

[Answer] The present position of the electronics sector is very satisfactory. The strong recovery trend observed in the past two years was continued in 1984. The projected sales of the data-processing electronics industry for 1984 will be around FF 155 billion, i.e. 4.3 percent of the commercial gross domestic product. As you know, that proportion was 4 percent in 1983 and 3.4 percent in 1980. These few figures point to an exceptionally strong industrial growth and warrant, if need be, the priority given by the government to the development of the electronics sector.

I would like to draw attention to another satisfactory index: whereas, in 1981-1982, our trade balance was undergoing a rapid and massive deterioration

--FF 11 billion in 1982--a spectacular recovery took place in 1983 (- 6 billion); it should be confirmed this year. Restoring the trade balance in 1985 is an objective that no longer appears to be out of reach. I expect to see a surplus in 1986. Remember that if the trends observed in 1981 had continued, they would have led to a deficit of FF 20 billion by 1986! The investments and research efforts made by the authorities and firms in the sector until now are in line with the figures you mention.

However, two problems remain, which will receive all my attention. First, employment. Employment growth, I believe, is still too slow. Then, the technological and commercial competitiveness of our products in a difficult environment. The ratio of "research and development" financing efforts in France and in the United States is 1 to 11; it is 1 to 3 with Japan. Our efforts, therefore, must be continued and intensified.

[Question] Would you consider a French-French cooperation between Bull and, for instance, CGE [General Electricity Company] or rather a partnership with a foreign firm?

[Answer] The question today is not whether Bull should get into a partnership with a given firm, but to do our best to prepare the future. I would mention, for instance, product compatibility based on common standards. In this respect, I can mention the effort made by 12 manufacturers in Europe, and the impetus provided by Bull where research is concerned.

[Question] Personnel training is also a problem in this sector. Data processing consulting companies even believe that this situation hinders their growth. What is your opinion?

[Answer] Obviously, in this sector as in others, training is the key factor in a successful modernization, and the efforts made since 1981 are without common measure with what had been done before. There is an improvement, but I am also aware of all that remains to be done.

[Question] Microcomputers are a French invention. Yet, France is lagging far behind in this sector. Is this situation irreversible?

[Answer] France does not consider that it lost out for good on microcomputers. Microcomputers are used in many consumer products: the minitel terminal or the smart card, for instance, in which we enjoy a quite enviable position worldwide. One of the problems we have to cope with is difficulty in marketing and in the ability to go rapidly from ideas in the lab to industrial realizations suitable for marketing. But we do have assets: our expertise in software, in integrating sound, image and data supports based in a more general manner on a consistent architecture. It is true that we are operating on a worldwide market and that we must often start with building blocks made by others. An intense international action is required to rationalize the efforts of the various partners.

[Question] Do you have a microcomputer on your desk?

[Answer] At the ministry, there are Thomson microcomputers in the hallway next to my office, but I do not use them. On the other hand, I accepted an invitation from the Bull chief executive officer, Jacques Stern, to go on a training period in his company.

[Question] Do you believe that it is good judgment to entrust the supervision of an industry where competition is fierce and where the law of the market is always stronger to an administration as unwieldy and as used to monopoly as the PTT Post and Telecommunications Administration ?

[Answer] The PTT do not hide behind any monopoly. Trends in the past few years have shown, for instance, that the operations of the DGT [General Directorate for Telecommunications] were comparable to those of any large U.S. companies such as GTE--General Telephone and Electric. The PTT experience development and competition. Therefore, they should always have the means, especially the financial credits, they need to remain very flexible in coordinating industrial efforts. This was the objective of the recent measures taken concerning the financing of the electronic sector.

Indeed, the present evolution of data processing involves connection to networks, so that voice, image and data processing systems can communicate. The communication networks must have increased transmission capacities.

[Question] In your opinion, layoffs will not solve France's industrial problems.

[Answer] Modernizing the French industry does not just mean laying off people although that is sometimes necessary. There is a lot more that must be done. Modernizing is not based solely on layoffs, and in particular workers' layoffs. In French firms, and in many older sectors, apart from workers, there are expenses that are often excessive. There are efforts that companies must make to improve their marketing strategies, their products--in particular in the automobile sector--and to modernize factories, in particular by having recourse to robots.

New working relations must be instituted as the workers' standard of living increases. This will require a social and technological dialogue among partners who understand what they are doing. It is the opposite of a policy that would consist in hiring illiterates to manufacture products of average quality and, therefore, not really competitive.

[Question] The French foreign trade deficit persists. Have French commercial achievements levelled off?

[Answer] Actually, I do believe that we have reached a level. On the one hand, we suffer from the repercussions of the drop in large international contracts, 40 percent in 1983. To take just one example, the Soviets gave us only FF 1.3 billion in large contracts last year, instead of the usual FF 5 to 7 billion. In addition, there has also been a reduction in large projects in developing countries. This is a difficult situation, and the effects of this drop in orders will still be felt in 1985. On the other hand, the dollar keeps rising and our energy bill has now reached FF 18 billion per month.

[Question] Are French exporters taking advantage of the dollar rise to gain a foothold on the American market?

[Answer] During the first 6 months of this year, our economic expansion post in New York received 30 percent more requests for information, in particular from small and medium-size firms. French firms, especially small and medium-size firms, do not lack dynamism, but neither do their competitors. Now, the Germans, the English and the Dutch have had distribution networks over there for decades, but we didn't. We do not have them for, 20 years ago, French manufacturers did not feel adventurous and made do with their domestic market. The French did not provide the physical presence that is a prerequisite to exporting. You cannot export by mail. Exporting is something you take care of every day in the field. You must accompany the product.

[Question] Precisely. Your new activities require you to follow major industrial dossiers. Will that not force you to restrict your travels abroad to accompany exporters?

[Answer] Not in the least. I just came back from the FRG where France has signed four large contracts. I am going to Tokyo in October, to a show where, for the first time, all French regions will be represented. They will exhibit consumer products.

[Question] Again perfumes, wines and dresses...

[Answer] I am selling what we have to sell. We have good consumer products; let us sell them. When it comes to sales, no products are superior to others. But be reassured: in a few months, France will be represented at the high-technology show organized at Tsukuba.

[Question] Your new ministry has been compared to a MITI [Japanese Ministry of International Trade and Industry] minus the funding...

[Answer] People always say that. By definition, there is never enough money. It is a typical French reaction to say: "I can't do that; I don't have the means." France's modernization is not just a question of money. Mainly, there is a lot to be done to get the people going.

[Question] Would you say that in France people lack money more than ideas?

[Answer] Usually, if you have a good idea, you will always find the money. Sometimes, of course, you can't get the money, and there are innovators who miss subsidies because information is still inadequate. I also believe that more could be done to enable company founders to obtain moderate loans, for newly created firms should not be given an excessive burden. Also, financial institutions should assume some risk so young entrepreneurs would not have to mortgage their grandmother's house.

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SCIENTIFIC AND INDUSTRIAL POLICY

FRANCE ANNOUNCES PROPOSED 1985 R&D BUDGET

Paris AFP SCIENCES in French 20 Sep 84 pp 8-16

[Unsigned article]

[Text] Paris--The 1985 research budget is "an island of prosperity in an ocean of austerity." This is the metaphor used by Hubert Curien, minister of research and technology, to qualify the proposed budget allocation for research, during his press presentation on 14 September.

While the state budget for 1985 is subject to reductions in mandatory withholdings, which implies a serious limitation in the growth of public spending, "research in this context is not only spared, but given preferential treatment," the minister pointed out.

The 1985 Civilian Budget for Technologic Research and Development (BCRD) is characterized by:

A definitely preferential endowment growth;

An active policy for scientific employment;

Clearly stated domestic priorities.

I -- Definitely Preferential Endowment Growth

A. The total BCRD endowment is 38.861 MF in ordinary expenditures (DO) and program authorizations (AP), compared to 36.835 MF in 1984, for a growth of 5.5 percent; and 36.707 MF in DO and payment appropriations (CP), compared to 34.147 MF in 1984, for a growth of 7.5 percent.

With the exception of the public debt, these growth rates are clearly higher than those of the civilian state budget, Mr Curien indicated; the positive difference is 2.5 points for DO + AP, and 2.8 points for DO + CP.

Compared to the resources effectively available in 1984 for research, the growth is 10.4 percent for DO + AP and 9.5 percent for DO + CP.

1. Ministry of Research and Technology	AP	DO
Provisions for charter reforms; regional centers; interventions; research allocations	--	409.1
Studies; forecasts; scientific and technical information	78.5	--
Research and technology funds	1169.9	--
ANVAR (National Association for Implementation of Research)	910.3	143.0
CNRS and national institutes	2051.8	6202.8
INSERM	510.0	977.5
Pasteur institutes (Paris, Lille, overseas)	142.0	127.9
INRA	410.0	1654.2
AEC	2198.1	4663.5
AFME (French Association for Energy Management)	330.0	32.0
CNES (National Space Studies Center)	--	571.5
IFREMER	435.4	296.1
ORSIOM	172.0	474.2
CIRAD	115.0	322.5
CESTA	3.0	22.0
Total	8526.1	15896.2
Joint services of MRT and Ministry for Industrial Redeployment; MRT central administration; research and technology regional delegates; School of Mines; [illegible text]-meteorology; high level computer specialists	75.4	217.3

2. Other ministries (general budget)	AP	DO
Agriculture	69.8	101.1
Culture	53.1	107.9
Overseas departments and territories	13.0	24.4
Consumption	--	0.4
National education	1085.2	193.9
Environment	47.5	7.4
Industrial redeployment and foreign trade	100.3	98.0
Domestic affairs	7.1	0.4
Justice	3.2	2.0
Seas and oceans	31.2	1.3
Territorial planning and improvement	--	18.5
Foreign relations	--	804.9
Social matters and national solidarity	37.1	81.4
Labor (EEC)	3.8	15.1
General services of the Prime Minister	5.9	8.8
Transportation	2268.6	188.2
(of which PDT civilian aeronautics)	(2067.5)	(--)
Urban matters-housing	156.8	187.5
Joint charges	1127.0	298.0
Total	5009.6	2146.2

3. Ministry of PTT (supplementary budget)	AP	DO	AP + DO
CNES	3421.0	--	3421.0
ADI	233.0	33.4	266.4
INRIA	90.0	133.0	223.0
CESTA	14.0	17.3	31.3
Electronics sector development	1898.9	--	1898.9
Capital endowments	1150.0	--	1150.0
Total	6806.9	183.7	6990.6
Total budget for civilian technical research and development	20418.0	18443.4	38861.4
Tax credits			400.0
Outside financing (Falcon 900, A 320, IRCHA)			353.0
Total			39614.4

Added to these budgetary endowments are:

The cost of the importation credit measure: 400 MF in 1985 against 750 MF in 1984, the first year of application, which covered the draft payment; without this payment, the predicted yield of this importation credit actually increases by nearly 15 percent;

Recourse to borrowing 300 MF for two aeronautical programs, Falcon 900 and A 320, justified by their satisfactory commercial prospects;

Financing of IRCHA-ITSA (Institute for Applied Chemical Research-ITSA) by the French Petroleum Institute (18.7 MF for AP and 34.8 MF for DO).

As a whole, the resources earmarked for 1985 approach 40 billion francs.

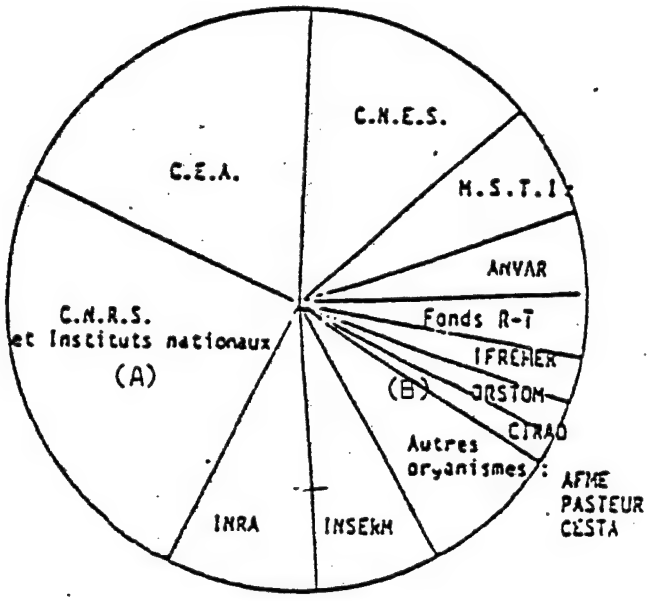
1) If we add the 19-20 billion francs for military research and development, Mr Curien declared, and the part which according to our estimates will be financed by the private sector, we have a 1985 national global research and development effort that exceeds 100 billion francs.

2) In 1984, this global effort was about 95 billion francs, equal to 2.22 percent of the gross national product (PNB). This percentage had been 2.16 percent in 1983 and only 1.8 percent in 1980, pointed out Mr Curien.

3) The law for research orientation and programming, passed by Parliament in July 1982, had stipulated that 2.5 percent of the PNB be devoted to research expenses in 1985, but as Mr Curien acknowledged, "the conditions have changed."

The distribution of these allocations among research organizations, ministry budgets, and the supplementary PTT budget, is described both in terms of ordinary expenses and program authorizations in the attached tables.

Major BCRD ministries



Key: (A) PTT (electronics sector and CNES)
(B) Transportation (civilian aeronautics)
(C) Other ministries
(D) STI (Science, Technology, and Industry) Museum (Villette)

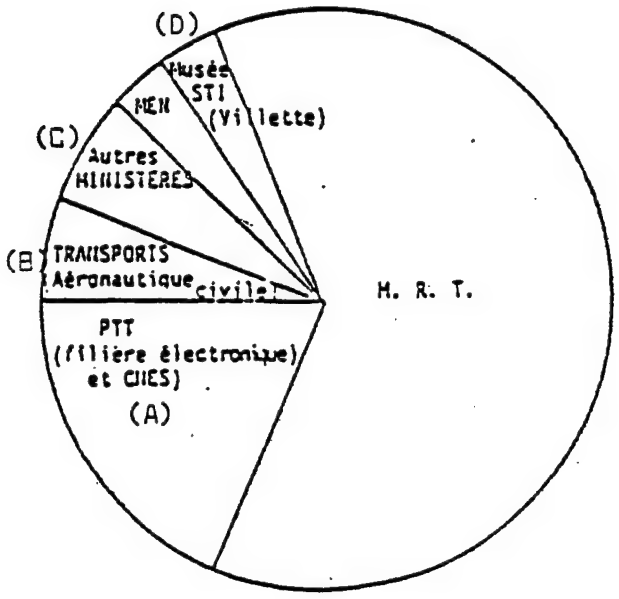
B. Outline of the 1985 BCRD

1. The BCRD implements the new scientific employment policy, which consists of two parts: one, compliance with the government's promises to reform the organizational chart of researchers, and of engineering, technical, and administrative personnel; two, the creation and reclassification of a very significant number of jobs (1008 new jobs and 814 reclassifications in research organizations), while the state's employment is reduced by about 5500 jobs.

2. Special priority is assigned to subsidies for programs that grow by 8 percent, for a volume growth of 2.8 percent.

3. The BCRD is also characterized by financing diversification, and notably by a greater contribution from the supplementary PTT budget. Financing of the electronics sector, started last year, is complemented by allocations from the the National Institute for Computer and Automation Research (INRIA) and from the Center for the Study of Administrative Computer Systems (CESIA).

Major Organizations



Key: (A) CNRS and national institutes
(B) Other organizations

PTT's participation in launching the technologies of the future is also found in the financing of CNES (National Center for Space Studies) space programs; personnel and other miscellaneous expenses at CNES remain in the budget of the Ministry of Research and Technology (MRT).

4. Lastly, the BCRD exhibits several internal changes and reorientations: refocusing the Fund for Research and Technology on the industrial sector, and clarification of its means of intervention; inception of a new diversification phase for AEC, completed merger of CNEXO (National Center for Ocean Exploitation) and ISTPM (Scientific and Technical Institute for Maritime Fishing) with the creation of IFREMER; creation of CIRAD; and so on.

II - Active Scientific Employment Policy

In terms of employment, the three-pronged action--"jobs creation," integration, job reclassification--adopted for 1985 "constitutes one the most positive components of the proposed budget." Several new measures have been stipulated: extension of part of the research allocations to three years; effect of reform in organizational structures (IFREMER, ORSTOM--Office for Overseas Scientific and Technologic Research, CIRAD, CESTA--Aquitaine Center

BCRD Program (1982-1985) by Categories of the Law of 15 July 1982
(in current MF)

A	B	C	D	E	F	G	H
1982	5094	(700) non-BCRD	5959	3511	6294	25,415	--
1983	7475	1100	7366	4147	8010	32,526	+13.5%
	+46.7%	*	+23.6%	+18.11%	+27.26%	+27.8%	
1984	8854	1840	8220	4655	8423	37,585**	+ 4.15%
	+18.5%	*	+11.6%	+12.25%	+ 5.20%	+15.3%	
1985	9800	1425	9000	5100	8500	39,614***	+ 2.85%
	+10.7%	*	+ 9.5%	+ 9.56%	--	+5.4%	
1982-1985	--	(n.s.)	--	--	--	--	+21.20%
	+92.3%		+51.03%	+42.45%	+35.0%	+55.89%	

* Final charges except for military expenses and except public debt
** Of which 750 tax credits
*** Of which 450 tax credits

for Scientific and Technologic Studies, IRT-ONSER--Institute for Transportation Research-National Organization for Highway Safety); provision for awarding special instatement bonuses for titularization; various relevelings and equalizations (DRRT, School of Mines, MIDIST, and so on).

All in all, the ordinary expenses included in the BCRD amount to 18,443 MF in 1985, against 16,886 MF in 1984 (for an overall growth of 9.2 percent).

a) Jobs Creation and Reclassifications

The 1008 created jobs are distributed among 408 positions to integrate personnel not incorporated in organizational charts, 536 research jobs, and 64 ITA (administrative engineers and technicians) jobs.

The research positions created amount to 3 percent of the personnel, "which will make it possible to establish a certain balance in recruiting," emphasized Mr Curien.

For ITA jobs, the 1985 budget gives priority to integration and promotions; the proposed budget authorizes 418 ITA job reclassifications, allowing 805 promotions and 396 research position reclassifications.

b) Implementation of Reform in Personnel Charts

The application of the framework organizational chart decree of 30 December 1983 is reflected in the 1985 proposed budget by a reclassification of jobs budgeted for contract work, into titulary positions (researchers and ITA) for five Scientific and Technical Public Establishments (CNRS--National Center for

Total Endowments

B C R D MF	(A) LFI 1984 (1)	(A) LFI 1985	(B) Progression	(C) Progression du budget de l'Etat (3)
D O	16 886	18 443,4	+ 9,2 %	+ 4,5 %
A P	19 949	20 418	+ 2,4 %	- 6,5 %
C P	17 261	18 264	+ 5,8 %	+ 5,8 %
DO + AP	36 835	38 861,4	+ 5,5 %	+ 3,0 %
DO + CP	34 147	36 707,4	+ 7,5 %	+ 4,7 %
(D) Crédit d'impôt	750 (2)	400 (2)	+ 14,2 % (2)	
(E) Financement externe	-	353	-	
Total en DO + AP	37 585	39 614,4	+ 5,4 %	
Total en DO + CP	34 897	37 460,4	+ 7,3 %	

Key: (A) Initial Finance Law
(B) Growth
(C) Growth of the State Budget
(D) Tax credit
(E) Outside financing
(1) After reclassification of endowments according to 1985 structure
(2) The real 1984 base is in fact 350 MF, except for the "account" payment specific to the first year of application, which biases the comparison
(3) Expenses of the civilian state budget, except for public debt

Scientific Research, INSERM--National Institute for Health and Medical Research, INRA--National Institute for Agronomic Research, ORSTOM, INRIA). The first decrees for each establishment will be published before the end of the year.

The measures associated with the new charts are already financed; they include the opening of one-fourth of the upper echelons, removal of quotas for seventh echelon research tasks, reclassification of research associates into research fellows, reclassification of ITA's, award of special instatement bonuses for titularized personnel, and so on).

c) Reforms in organizational structures are also financed by the proposed budget: creation of IFREMER with reclassification of ISTPM agents; first measures for re-evaluating the situation of ORSTOM personnel with 108 reclassifications of researcher jobs; integration of 14 IFRAC agents within CIRAD; inclusion of 69 CESTA budgetary positions in BCRD; and creation of 135 positions determining the merger of IRT and ONSER.

d) The 1985 proposed budget stipulates 13 MF for extending to three years the duration of research allocations in life sciences, in the science of man and society, and in 10 percent of the other disciplines (notably earth sciences).

III -- Clearly Stated Domestic Priorities

1. Distribution of the BCRD according to the categories of the Law of 15 July 1982, shows a "confirmation of the relative priorities stated in 1984," beginning with the financing of mobilizing programs (+5.5 percent in volume except Villette), an "effort toward fundamental research similar to the one in 1984" despite a more limited growth in the BCRD (+4.3 percent in volume), and a "relatively steady growth in applied and implemented research allocations (+4.3 percent in volume)."

No precise figures can be given for the mobilizing programs before each of the organizations involved has established its proposed budget for 1985 on the basis of the scientific orientations provided by MRT. It can be indicated that "definite priorities" will be given to the electronics sector and to biotechnologies. "The effort will be very sustained" in "employment-working conditions" programs and in "developing nations." By the same token, relatively lower allocations will be made for "energy" programs which have reached a certain maturity, and for "the industrial fabric" which must seek other financing sources outside the budget. Lastly, the "scientific culture" program should complete Villette (-34 percent in program authorizations, but creation of 510 jobs to assure the opening and operation of the museum).

2. A more analytic description of the BCRD program authorizations also makes it possible to pinpoint priorities.

Appropriations for the electronics sector as a whole are 17 percent higher, with strong priority for incentive allocations.

Space programs will increase by nearly 11 percent, and AEC's share in the BCRD is 5.7 percent higher. Civilian aeronautics program resources will grow by 3.5 percent.

Lastly, support for programs is higher by a strong 8 percent, as already mentioned, while incentive actions outside the electronics sector are globally reassessed in current francs, with the gap to be increasingly filled by financing outside the budget.

As a whole, the actual growth in equipment resources made available to research in 1985, except for Villette and after correction for the 1984 base payment of the importation credit, is 7.9 percent in program authorizations, for a volume growth of 2.7 percent, which is higher than the growth expected for PIB (gross domestic product), and of 7.6 percent in payment appropriations.

Hubert Curien's Cabinet

The cabinet of Hubert Curien, minister of research and technology, includes:

Gerard Moine, cabinet director
Jean Pierre Chevillot, cabinet deputy director, in charge of research organizations, university research, and coordination of international affairs
Marie-Claude Ledur, chief of cabinet
Marie Elliott, in charge of scientific and technical information, and communication; press relations
Dominique Ferriot, in charge of cultural and regional matters; training
Dominique Francois, in charge of relations with Parliament and political organizations
Jean-Paul Langlois, in charge of industrial research
Jean Marie Martin, in charge of sciences of man and society
Daniel Sacotte, in charge of technologic development
Simone Touchon, in charge of financial and budgetary matters; charter questions

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CSO: 3698/19

NETHERLANDS, FRG AGREE ON 'MEGA-PROJECT'

Governments To Grant Millions

The Hague ANP NEWS BULLETIN in English 12 Oct 84 pp 1-2

[Text]

E i n d h o v e n, October 11 - Europe's two largest electronics companies today announced a major project to develop a new generation of electronic chips and snatch a leading position for Europe in micro-electronics.

Philips of the Netherlands and Siemens of West Germany said they would together invest some 1.5 billion guilders (430 million dollars) over the next five years to create 'super-chips' with far greater memory capacity than chips currently in use.

Europe has so far lagged well behind in the fast-growing production of chips, now becoming a vital building block for equipment in most of industry as well as home appliances.

In 1984 U.S. companies are expected to take 55 per cent of world chip sales of some 20 billion dollars, with Japanese firms taking 30 and Europe just 15 per cent, of which Philips will account for nearly half, according to Philips' estimates.

Govt. Grants

The West German and Dutch government hailed the companies' accord as a key step forward for European industry and said they expected to contribute about 500 million guilders in subsidies towards the total investment.

Dutch Economics Minister Gijs van Aardenne told parliament the government would make a grant of up to 190 million guilders to develop the new 'super-chip'. But he added the grant was still subject to confirmation early next year after a more thorough government study of the project.

Philips and Siemens, respectively the 26th and 29th largest industrial companies in the world, each plan to contribute about half the cost of the project. Exact figures were not given at a news conference at Philips headquarters here today.

They will coordinate research and development and exchange all information on efforts to produce the new chip, but will maintain separate production, spokesmen said. They expect to continue cooperation after the present five-year project ends.

Philips is to set up a new 240-million-guilder technology centre at its headquarters in the southern Netherlands as well as a 160-million-guilder development centre.

Production Plant

A new production plant is to be built in Nijmegen in eastern Netherlands where the results of the company's research and development is to be put into practice. How much Philips will invest in this plant was not disclosed.

More than half its investment will go towards building and equipment, and it will hire 500 new staff, of whom 300 will be academics or other highly qualified workers.

The companies, which have cooperated in the past in this field, hope to begin pilot production of the new high-capacity units in 1986.

'By combining the forces of two European governments and two leading private companies, Europe will provide itself with a unique opportunity to achieve a leading position in the world of micro-electronics', a Philips statement said.

The two partners are aiming at a chip capable of handling 60 times the information of present-day chips.

Experts React

The Hague ANP NEWS BULLETIN in English 12 Oct 84 pp 2-3

[Text]

E i n d h o v e n, October 12 - Dutch industry analysts last night welcomed plans announced by two European companies to outflank the United States and Japan in micro electronics but warned that this would be difficult to achieve.

They were agreed that Philips of the Netherlands and Siemens of West Germany were the only European companies with the resources to rival the Americans and Japanese.

'They complement one another both in business philosophy and areas of operation', Frederick Vergunst of Pierson, Heldring and Pierson Bank said.

'Philips has concentrated on the consumer market, and Siemens is strong in communications and heavy electrical engineering'.

But he cautioned: 'It is hard to say if they can achieve Philips aim of a leading position by 1990'.

The two companies are aiming at a super-chip capable of handling 60 times the information of present-day chips.

To do so, they must develop the technology to create circuit elements smaller than one micron - one-millionth of a metre. The smalles elements at present are about two microns in size, but Philips is aiming at 0.8 microns by 1990 and 0.3 after this.

The two groups plan to use light optics in making more advanced chips, since they already have experience with this system. This method involves incising circuits in silicon wafers by projecting light through glass plates containing enlargements of the circuits. The projection must be highly accurate.

Both companies yesterday emphasised the major technical problems in developing the chips and West German technology ministry spokesman Gert Scharrenberg said official support showed recognition of the risks involved.

Division of Labour

Philips is to try to make a chip with one million 'yes-no' bits of information, known as megabit, which will have a static memory. This is a memory which is relatively permanent.

Siemens is to work on a chip of four megabits, but with a less permanent 'dynamic' memory. The two chips would be of about equal complexity.

The greater density of information will allow smaller and cheaper chips and expand the roles for which they can be used.

'They will form an essential part of fields like super-highspeed computers which will in turn set the pace of industrual progress in the decades ahead', one expert said.

Siemens spokesman Werner Oesl said the firms would probably not be first to sell a one megabit static memory chip but ought to be level with competitors on the four megabit unit.

Both companies will continue separate research in other areas of microelectronics, in which they each expect to spend many hundreds of millions of dollars in coming years.

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END